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Research Article

Disaster Supervision and its Social Effect based on IOT

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A B S T R A C T

Disaster is a non avoidable element, on the off chance that it is goes under characteristic catastrophes such has earthquakes, flood, tsunami however we can take preventive activities on the same. To limit the harm or loss of lives in the outcome of a calamity, it is vital that rescuers can follow and make healing move on fiasco. The conventional correspondence framework like cell phones and other correspondence framework is ordinarily relies upon the foundation based system. In this paper we attempt handle a similar kind of issue with the assistance of IoT and furthermore centered around the effect of the minimal effort IoT answer for tackle this sort of issue. The primary concentration of our paper is to utilize the minimal effort IoT devices and power of open source community to enhance the forecast of the calamities.

Keywords: IoT, Attiny85, Arduino, Open Source Community, GIS (Geographical Information System), EWS (Early warning System), ESP8266

Introduction

Various activities have since been taken by the nation in the range of disaster management. Additionally national calamity management system has been produced by the service of home undertakings. The structure completely covers all parts of disaster management. including the institutional component, catastrophe avoidance, lawful and strategy structure, early cautioning frameworks, fiasco readiness and human asset improvement. Likewise loads of technique like Satellite following, GIS (Geographical Information System) and GPS based frameworks are sent for the identification and the aversion of the fiasco, But the issue is its cost and time required to keep up and introducing the framework. Rather IoT is the modest technique to track and send information with respect to the relocation of the stones/ lands and other geographical data, per-data about the calamity which is to be happen. There are bunches of open source equipment/ programming accessible present in the market and furthermore support for the same. Also the chip like attiny85 and arduino pro-mini like processing/ development board are cheap in cost and gives better results. Whatever is left of the paper is sorted out as takes after. Section I depicts the effect of the disaster where we demonstrates the details of the powerless terrains of the nation likewise portrays the issues the present framework. The Section II of the paper will demonstrate the idea of IoT, gadget drifts, and related conjectures. In Section III we talk about the purposes behind choosing IoT-based correspondences as a supportive innovation for fiasco interchanges. Segment IV will depict the upside of IoT in a fiasco management and the advantages to the economy of the disaster management. In last area of the paper will close the advantages of IoT with its social effect.

Problems in Current System

Considering the problem after disaster Normal communication lines are affected and normal business activities are strained. Initial mitigation steps must be taken to preserve the structure and contents.[1]

So the we need to think about the system which can give service even after the disaster of the infrastructure. The solution is adhoc based system. We all know that in such disaster-stricken areas, the first 24-48 hours are crucial to assess the situation and to save lives. Communications become a vital means of life-saving efforts and critical decision making. The trapped victims may have the following questions:

- Where can I get drinking water?
- Where can I get medical support?
- Can I use this road to reach in a safe place?
- How can I get shelter from bad weather?

Many of these questions can be answered with access to the right information[3]

Disaster Prone Area in India

57% land is vulnerable to earthquakes. Of these, 12% is vulnerable to severe earthquakes.

- 68% land is vulnerable to drought.
- 12% land is vulnerable to floods.
- 8% land is vulnerable to cyclones.

Many cities in India are also vulnerable to chemical, industrial and man-made disasters.[2]

IoT as a Solution for Disaster Management

In section I of this paper we discussed about the disaster prone area and effect of disaster on the infrastructure based communication on other side IoT devices are adhod if they got the Internet from any sources. But the big question is where we need to install these IoT devices for the better result. The solution to this is GIS (Geographical Information System). The development of a National Database for Emergency Management (NDEM) has been taken up. NDEM 11 is a GIS based repository of data to support disaster/emergency management in the country. NDEM aims to organize a multi- scale geo spatial database and development of a decision support system for disaster management. BHUVAN is single largest Web GIS portal by Indian Space Research Organization (ISRO) for free data & services over India allowing 3D & 2D visualization, street map overlays, services for land use and land cover, flood inundations, ego-hazards and other services. States have also built ego-informatics decision support systems. The flagship program of Digital India also has a mission mode project on GIS[2]

Deploying IoT Devices for the Data Gathering

Onces we got the location of the most vulnerable area from the GIS then second step to do is installing the IoT devices and making a chain of the same. The data gather by these devices will given to the IoT platform and then we can analyses that data for the vulnerability. In our case we uses the Xively and Thingspeak platform. The reason behind the selection is its easiness and free to use for limited period.

Platform for Analysis of Data

Platform

Xively (formerly known as Cosm and Pachube) is a division of LogMeIn Inc. (NASDAQ: LOGM), a global, public company that provides remote access and collaboration products including Rescue, Boldchat, join.me, and Cubby. Xively by LogMeIn offers an Internet of Things (IoT) platform as a service, business services, and partners that enable businesses to quickly connect products and operations to the Internet. It is pronounced "zively" (rhymes with lively).[3] ThingSpeak is an Internet of Things (IoT) platform that lets you collect and store sensor data in the cloud and develop IoT applications. The ThingSpeakTM IoT platform provides apps that let you analyze and visualize your data in MATLAB®, and then act on the data. Sensor data can be sent to ThingSpeak from Arduino®, Raspberry PiTM, BeagleBone Black, and other hardware.[4]

Sensors used for the Data Gathering

Arduino

The Arduino is an open-source prototyping platform based on flexible and easy-to-use hardware and software. It is a single-board microcontroller, designed to make the process of using electronics in multidisciplinary projects easier. The exposed connectors in the Arduino enable the processor to be connected to add-on modules.

The Arduino is able to communicate with software executing on a connected computer.

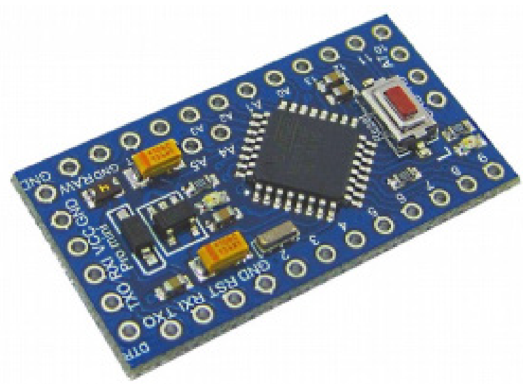

Figure 1.Arduino Mini-Pro Development Board

The Arduino system easily interfaces with a computer via USB when programming is required. The Arduino on the other hand has no significant permanent storage abilities, but mostly incorporates volatile RAM. The Arduino cannot just directly connect to either a monitor or keyboard and usually does not host an operating system.[5]

Digital Accelerometer

The ADXL345 is a small, thin, low power, 3-axis accelerometer with high resolution (13-bit) dimension at up to ±16g. Digital output data is formatted as 16-bit two's complement and is available through either a SPI (3- or 4- wire) or I2C digital interface.

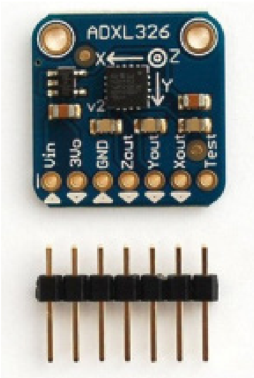

Figure 2.Digital accelerometer Sensor

The ADXL345 is well suited for mobile device applications. It measures the static acceleration of gravity in tilt-sensing applications, as well as dynamic acceleration resulting from motion or shock. Its high resolution (4 mg /LSB) enables measurement of inclination changes less than 1.0°.[6]

ESP8266 or ESP8266 12-E

The ESP8266 is a low-cost Wi-Fi chip with full TCP/IP stack and MCU (microcontroller unit) is a newly developed IEEE 802.11 based serial Wi-Fi module which can be powered up at 3.3Volt dc supply.

Figure 3.ESP8266, MOD12-E

The ESP8285 is an ESP8266 with 1 MiB of built-in flash, allowing for single-chip devices capable of connecting to Wi-Fi separately.[7]

Real Time Sensor Integration with Cloud

The Arduino uses either wired or wireless connectivity to feed the sensor data to online cloud storage medium. The cloud platforms utilized for uploading and storing the data are Thingspeak and Xively. Both of them generate an API key for individual user and a channel or feed ID as well. Figure 3 shows the various services provided by the Thingspeak cloud platform.[7] Think Speak Cloud Interface API key is used in the Arduino code written in Arduino IDE to update and retrieve the data to the cloud server. Once an API key is assigned to a user then Thingspeak will connect to the device and we can do the analysis.[7]

Impact of Time Criticality

The main requirements for physical environment IoT EWS are:

- Time-critical sensor data exchange, i.e., the combination of detection time, assessment time and citizen evacuation time needs to be minimal compared to the physical propagation time for a critical event, e.g., tsunami. The seismic sensor sub-system of a tsunami EWS is expected to issue a warning within 2-3 minutes after an event is detected.
- To be able to scale-up (scalability) to deal with information floods as publisher numbers and rates increase and scale-down (resilience) to handle local bottlenecks for upstream information communication caused by local physical network and power disruptions. Note it is presumed that the downstream communication is remote to and away from, the region of the environment disaster. As such it is not as prone to be disrupted. It is also assumed to have some degree of fault-tolerance.
- An EWS needs to support semantics to support context-awareness of crisis events in order to adapt information services and to support data and service interoperability.[8]

IOT for Disaster Management

Besides the traditional use-cases for the industry that it can offer, the Internet of Things also has the potential to serve a critical, potentially life-saving, role in the event of disaster, natural or otherwise. The mobile, cloud, analytical and social age in which we live today is creating new opportunities to transform traditional emergency and disaster operations and engage with citizens and stakeholders.

By aligning these technologies towards the strategic charter, agencies can attain new levels of speed, responsiveness, quality and agility. Internet of things offers disruptive potential in prevention, preparation, response and recovery phases of disaster management. Where response includes Vehicle tracking and GIS integration Use of sensors to monitor the movement of key personnel, Using NFC for geo fencing and parameter fencing, Situational awareness and incident management through streaming data, unstructured data handling, predictive analysis, big data, complex event processing and social media analytics.[2]

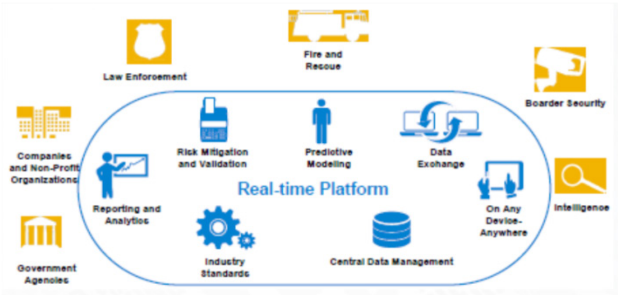

Figure 4.Overview of IoT for disaster management

Harnessing the Power of Data for IOT

Harnessing big data, analytics, social media and mobility in this sector allows emergency & disaster management organizations to accommodate massive amounts of incoming public safety data. With the mobile visual analytics of Business Intelligence (BI) solutions, personnel can increase situational awareness and make rapid decisions. Moreover, giving mobile access to that information helps first responders to better anticipate and respond to rapidly evolving situations.[2] If we compare this data with current scenario then we will find that, the average household device generate nearly 32gb of data in a year and it will increase 10 times more by 2020.[8]

Conclusion

Since IoT is in its initial stage but the possibility of this technology is huge. The Hardware cost of the IoT enabled system and the benefits of the open source code and support from the open source community is boon for this technology. using these modules for the disaster management, we consider about the cost and efficiency. Right now this system is in its initial stage and that's why little prone to cyber attacks. But the possibility of this system to save human life is more and the data gathered by the system is too much precious for the later time to predict any disaster. Considering the section II and III we can deploy this low cost devices and analyse the data then we can get better information about the disaster and it will leads to better prediction and give enough time to manage the resources to handle the disaster in a better way. Section VIII and X leads us to think about the technologies which will open the new door to handle the situation in a easy and secure manner.

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